Abstract
Chronic venous insufficiency is a common ailment that affects millions of Americans annually. Compression stockings are the gold standard of treatment; however, studies have indicated difficulties associated with donning them, which can result in a lack of use, leading to development of more severe conditions. The goal of this project is to develop a device that can mitigate the forces necessary to don a compression stocking that is financially accessible and can be used by those with a low strength capacity. Multiple designs of this device were created although a final design was unable to be 3D printed and tested due to COVID-19.

Methods I Design I Analysis
The design created utilizing SolidWorks and was 3D Printed utilizing PLA filament for the mechanism and titanium for the fin pieces. A design iteration was conducted to maximize ease of use. Prototype I utilized a spring mechanism to open the compression stockings while Prototype II utilizes two linear actuators. Design specification testing shall utilize a force transducer to confirm that the force required to don a compression stocking with the device is at least 50% less than the forces required without. Final testing was intended to be conducted on 25 random users, who would be asked to don a compression stocking with and without the device. The level of difficulty (1-5) shall be reported for each attempt. Final testing would have assumed a null hypothesis of the median score difference between data sets equal to zero (Wilcoxon Signed Rank test).

Results
- Assembly and testing of a final product were unable to be completed due to COVID-19
- Initial Killer Experiment trials indicated the need for stronger fins. The decision was made to transition from fins made from PLA filament to titanium. Both sets of fins were designed in SolidWorks and were 3D printed.
- Initial Killer Experiment trials indicated lack of feasibility with spring loaded system. Further designs utilized a linear actuator as an alternative to the spring/trigger system.

Conclusion
- The design and prototype of the device attempted to mitigate the difficulty of donning compression stockings in all population in an affordable manner
- Given the extraneous circumstances of COVID-19, design validation and statistical analysis were unable to be completed
- The condition of affordability was assured via 3D printed prototype manufacturing and assembly
- If statistical analysis was able to be conducted, rejection of the null hypothesis would have verified the decrease in donning difficulty

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References
Cleveland Clinic. Chronic Venous Insufficiency (CVI).